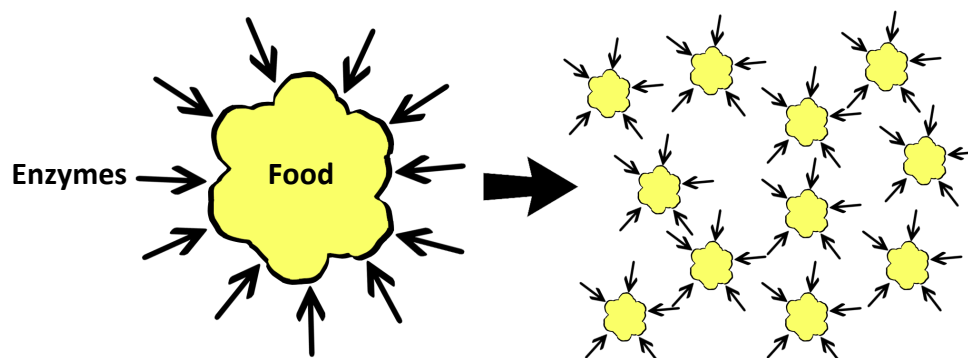


Lipids are mainly obtained through our diets. They need to be properly extracted and broken down from our food before they can be absorbed into our bodies.

Lipid breakdown:

There are two stages to breaking down lipids for absorption, these are physical breakdown and chemical breakdown.

Physical breakdown happens mainly in the mouth and stomach and involves physically breaking up the food you ingest. The mouth does this via chewing with the teeth to tear and break up the food, and the stomach has muscles that contract to churn and further break up the food. This is necessary to make it possible to swallow large chunks of food, but also to increase the surface area enzymes can act upon during chemical breakdown.

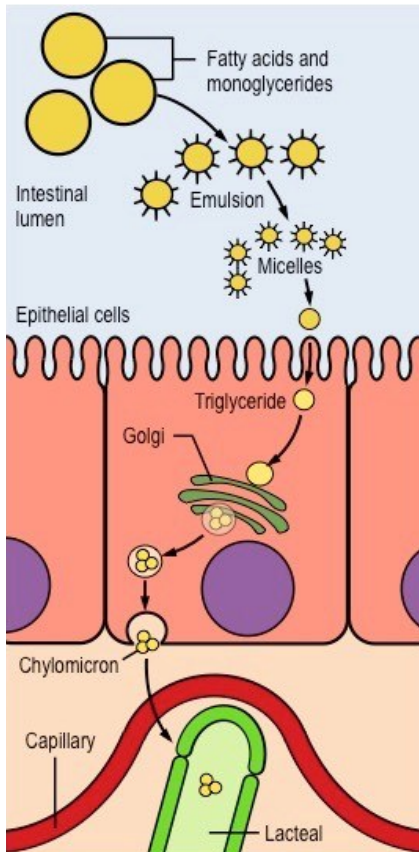


▲ *The physical breakdown of food allows more enzymes to act at once, therefore making digestion faster.*

In the case of lipids, they can also be broken down further in the small intestine (ileum). This is done by bile salts that are produced in the liver and transported into the small intestine via the bile duct. The bile salts break up lipid droplets into tiny structures in a process called emulsification. This provides an even larger surface area for enzyme action.

Chemical breakdown of lipids is done by lipase enzymes which are free floating in the ileum (some enzymes like disaccharidases are bound to the membranes of villi epithelial cells). They are synthesised in the small intestine but can also be synthesised in the pancreas and transported to the small intestine. These enzymes hydrolyse the ester bonds in triglyceride molecules using water to produce monoglyceride molecules and fatty acids. The fatty acids and monoglycerides remain in association with the bile salts that initially emulsified them, forming tiny structures called micelles.

Micelles will eventually come into contact with the plasma membrane of a villi epithelial cell through the movement of materials within the intestinal lumen. At this point they break down, releasing the monoglycerides and fatty acids, which can diffuse easily across the membrane into the epithelial cells as they are non-polar.

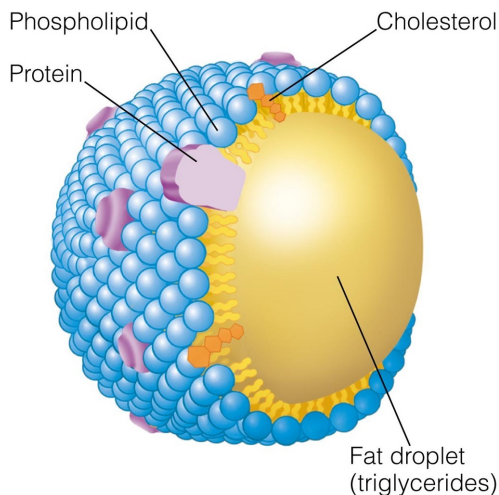


Once inside the epithelial cell the monoglycerides and fatty acids are transported to the endoplasmic reticulum where they are recombined into triglycerides. Then they are transported to the golgi apparatus where cholesterol and lipoproteins (lipids combined with proteins) are added onto each molecule to form chylomicrons. Chylomicrons are specialised particles that help transport lipids safely around the body.

These chylomicrons exit the epithelial cells (via exocytosis) and enter specialised transport vessels called lacteals which are part of the lymphatic system. From here the chylomicrons pass from the lymphatic vessels to the blood where they can be transported and used around the body.

◀ *Diagram showing the breakdown and absorption of lipids in the ileum from large droplets to chylomicrons.*

From BioNinja at: <https://ib.bioninja.com.au/standard-level/topic-6-human-physiology/61-digestion-and-absorption/lipid-absorption.html>



◀ *Diagram showing the structure of a chylomicron particle. It consists of a lipid droplet surrounded by a membrane like structure made of phospholipids with cholesterol and proteins embedded.*

From Biology forums at: <https://biology-forums.com/index.php?PHPSESSID=o57369v5av1aqs8uio39dth11;action=gallery;sa=view;id=36711>